



RAVINDRA COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous)

M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

SEMESTER – I

S. No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	C15801	Advanced Data Structures and Algorithms	PC	3	0	0	3
2.	C15802	Advanced Computer Networks	PC	3	0	0	3
3.	C15803a C15803b C15803c	Program Elective Course - I	PE	3	0	0	3
		Natural Language Processing					
		Object Oriented Software Engineering Digital Image & Video Processing					
4.	C15804a C15804b C15804c	Program Elective Course - II	PE	3	0	0	3
		Data Science					
		Design Patterns Information Security					
5.	C15805	Advanced Data Structures and Algorithms Lab	PC	0	0	4	2
6.	C15806	Advanced Computer Networks Lab	PC	0	0	4	2
7.	C15807	Research Methodology and IPR	MC	2	0	0	2
8.	C15808a C15808b C15808c	Audit Course – I	AC	2	0	0	0
		English for Research paper writing					
		Disaster Management Sanskrit for Technical Knowledge					
Total							18



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SEMESTER – II

S.No.	Course codes	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	C15809	Advanced Operating Systems	PC	3	0	0	3
2.	C15810	Applications of AI	PC	3	0	0	3
3.	C15811a C15811b C15811c	Program Elective Course – III Block Chain Technology and Applications Service Oriented Architecture Computer Vision	PE	3	0	0	3
4.	C15812a C15812b C15812c	Program Elective Course - IV Data Visualization Techniques Distributed Systems Privacy Preserving Data Publishing	PE	3	0	0	3
5.	C15813	Advanced Operating Systems Lab	PC	0	0	4	2
6.	C15814	Applications of AI Lab	PC	0	0	4	2
7.	C15815	Technical seminar	PR	0	0	4	2
8.	C15816a C15816b C15816c	Audit Course – II Pedagogy Studies Stress Management for Yoga Personality Development through Life Enlightenment Skills	AC	2	0	0	0
Total							18



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SEMESTER - III

S.No.	Course codes	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	C15817a C15817b C15817c	Program Elective Course – V Software Defined Networks Reinforcement Learning Generative AI and Large Language Model	PE	3	0	0	3
2.	C15818a C15818b C15818c	Open Elective Industrial Safety Business Analytics Optimization Techniques	OE	3	0	0	3
3.	C15819	Dissertation Phase – I	PR	0	0	20	10
4.	C15820	Co-curricular Activities					2
Total							18

SEMESTER - IV

S.No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	C15821	Dissertation Phase – II	PR	0	0	32	16
Total							16



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COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED DATA STRUCTURES AND ALGORITHMS	L	T	P	C
C15801		3	0	0	3
Semester		I			
Course Objectives:					
<ul style="list-style-type: none"> To understand concepts of dictionaries and hash tables. To implement lists and trees. To analyze usage of B trees, Splay trees and 2-3 trees. To understand the importance of text processing and computational Geometry. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Understand the implementation of symbol table using hashing techniques Apply advanced abstract data type (ADT) and data structures in solving real world problem Effectively combine the fundamental data structures and algorithmic techniques in building a solution to a given problem Develop algorithms for text processing applications 					
UNIT - I					
Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries, Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.					
UNIT - II					
Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists, Trees: Binary Search Trees (BST), AVL Trees, Red Black Trees: Height of a Red Black Tree, Red Black Trees Bottom-Up Insertion, Top-Down Red Black Trees, Top-Down Deletion in Red Black Trees, Analysis of Operations.					
UNIT - III					
2-3 Trees, Advantage of 2-3 trees over Binary Search Trees, Search and Update Operations on 2-3 Trees, Analysis of Operations, B-Trees: Advantage of B-trees over BSTs, Height of B-Tree, Search and Update Operations on 2-3 Trees, Analysis of Operations, Splay Trees: Splaying, Search and Update Operations on Splay Trees, Amortized Analysis of Splaying.					
UNIT - IV					
Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem					
UNIT - V					
Computational Geometry: One Dimensional Range Searching, Two-Dimensional Range Searching, constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadrees, k-D Trees.					
Textbooks:					



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| <ol style="list-style-type: none">1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, second Edition, Pearson, 2004.2. T.H. Cormen, C.E. Leiserson, R.L.Rivest, Introduction to Algorithms, Third Edition Prentice Hall, 2009 |
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Reference books:

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| <ol style="list-style-type: none">1. Michael T. Goodrich, Roberto Tamassia, Algorithm Design, First Edition, Wiley, 2006. |
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Course Code	ADVANCED COMPUTER NETWORKS	L	T	P	C
C15802		3	0	0	3
Semester		I			
Course Objectives:					
<p>The objective of this course is to build a solid foundation in computer networks concepts and design</p> <ul style="list-style-type: none"> To understand computer network architectures, protocols, and interfaces. The OSI reference model and the Internet architecture network applications. The course will expose students to the concepts of traditional as well as modern day computer networks - wireless and mobile, multimedia-based. Students completing this course will understand the key concepts and practices employed in modern computer networking 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Analyse computer network architectures and estimate quality of service Design application-level protocols for emerging networks Analyse TCP and UDP traffic in data networks Design and analyse medium access methods, routing algorithms and IPv6 protocol for data networks Analyse Data Center Networks and Optical Networks 					
UNIT - I					
Network Architecture, Performance: Bandwidth and Latency, High Speed Networks, Network-Centric View, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks, Overlay Networks: Routing Overlays, Peer-to-Peer Networks and Content Distribution Networks, Client-Server Networks, Delay-Tolerant Networks,					
UNIT - II					
Switching: Circuit-Switched Networks, Datagram Networks, Virtual-Circuit Networks, Message-Switched Networks, Asynchronous Transfer Mode: Evolution, Benefits, Concepts, Exploring Broadband Integrated Services Digital Network, Layer and Adaptation Layer, IPv4: Address Space, Notations, Classful, Classless, Network Address Translation, Datagram					
UNIT - III					
Fragmentation and Checksum IPv6 Addresses: Structure, Address Space, Packet Format and Extension Headers, ICMP, IGMP, ARP, RARP, Congestion Control and Resource Allocation: Problem, Issues, Queuing, TCP Congestion Control, Congestion-Avoidance Mechanisms and Quality of Service,					
UNIT - IV					
Internetworking: Intra-Domain and Inter-Domain Routings, Unicast Routing Protocols: RIP, OSPF and BGP, Multicast Routing Protocols: DVMRP, PIM-DM, PIM-SM, CBT, MSDP and MOSPF, Spanning Tree Algorithm, Optical Networking: SONET/SDH Standards, Traffic Engineering: Requirement, Traffic Sizing, Characteristics, Protocols, Time and Delay Considerations, Connectivity, Availability, Reliability and Maintainability and Throughput.					
UNIT - V					
Multimedia Over Internet: Transmission, IP Multicasting and VoIP, Domain Name System: Name Space, Domain Name Space, Distribution, Domains, Resolutions and Dynamic Domain Name System, SNMP, Security: IPSec, SSL/TLS, PGP and Firewalls, Datacenter Design and Interconnection Networks.					
Textbooks:					
<ol style="list-style-type: none"> Larry L. Peterson and Bruce S. Davie, Computer Networks: A System Approach, Fifth Edition, Morgan Kaufmann, Elsevier, 2012. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, Fifth Edition, 2017. 					



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| <ol style="list-style-type: none">3. Chwan-Hwa (John) Wu, J. David Irwin, Introduction to Computer Networks and Cyber Security, CRC press, Taylor & Francis Group, 20144. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Pearson, 5th Edition, 2014. |
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Reference Books:

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| <ol style="list-style-type: none">1. Satish Jain Advanced Computer Networking: Concepts and Applications |
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COURSE STRUCTURE & SYLLABI

Course Code	NATURAL LANGUAGE PROCESSING	L	T	P	C
C15803a		3	0	0	3
Semester		I			
Course Objectives:					
<ul style="list-style-type: none"> • Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP) • Discuss approaches to syntax and semantics in NLP. • Examine current methods for statistical approaches to machine translation. • Teach machine learning techniques used in NLP. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> • Understand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python. • Apply the various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy. • Understand the fundamentals of CFG and parsers and mechanisms in ATN's. • Apply Semantic Interpretation and Language Modelling. • Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization 					
UNIT - I					
The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.					
UNIT - II					
Grammars and Parsing- Top-Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayes Rule, Shannon game, Entropy and Cross Entropy.					
UNIT - III					
Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.					
UNIT - IV					
<p>Semantic Interpretation Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts & embedded sentences, Defining semantics structure model theory.</p> <p>Language Modelling Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.</p>					
UNIT - V					
<p>Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.</p> <p>Multilingual Information Retrieval Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.</p>					
Textbooks:					



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COURSE STRUCTURE & SYLLABI

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice-Daniel M.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, AksharBharathi, Vineetchaitanya, Prentice-Hall of India.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.



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COURSE STRUCTURE & SYLLABI

Course Code	OBJECT ORIENTED SOFTWARE ENGINEERING	L	T	P	C
C15803b		3	0	0	3
	Semester	I			
Course Objectives:					
<ul style="list-style-type: none"> To learn and understand various O-O concepts along with their applicability contexts. Given a problem, identify domain objects, their properties, and relationships among them. How to identify and model/represent domain constraints on the objects and (or) on their relationships To learn various modelling techniques to model different perspectives of object-oriented software design (UML) 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Discuss about software development process models Identify the contemporary issues and discuss about coding standards Recognize the knowledge about testing methods and comparison of various testing techniques. Use the concept and standards of quality and getting knowledge about software quality assurance group. 					
UNIT - I					
Introduction to Software Engineering - Software Development process models – Agile Development - Project & Process - Project management - Process & Project metrics - Object Oriented concepts, Principles & Methodologies.					
UNIT - II					
Software Requirements Specification, Software prototyping - Software project planning - Scope - Resources - Software Estimation - Empirical Estimation Models – Planning - Risk Management - Software Project Scheduling - Object Oriented Estimation & Scheduling.					
UNIT - III					
Analysis Modelling - Data Modelling - Functional Modelling & Information Flow - Behavioural Modelling - Structured Analysis - Object Oriented Analysis - Domain Analysis - Object oriented Analysis process - Object Relationship Model - Object Behaviour Model, Design modelling with UML.					
UNIT - IV					
Design Concepts & Principles - Design Process - Design Concepts - Modular Design - Design Effective Modularity - Introduction to Software Architecture - Data Design - Transform Mapping - Transaction Mapping - Object Oriented Design - System design process - Object design process - Design Patterns.					
UNIT - V	Lecture Hrs:				
Top - Down, Bottom-Up, object-oriented product Implementation & Integration. Software Testing methods - White Box, Basis Path-Control Structure - Black Box - Unit Testing - Integration testing - Validation & System testing - Testing Tools – Software Maintenance & Reengineering.					
Textbooks:					
<ol style="list-style-type: none"> Fairley R, "Software Engineering Concepts", second edition, Tata McGraw Hill, New Delhi, 2003. Jalote P, "An Integrated Approach to Software Engineering", third edition, Narosa Publishers, New Delhi, 2013. 					
Reference Books:					
<ol style="list-style-type: none"> Grady Booch, James Rumbaugh, Ivar Jacobson - "the Unified Modeling Language User Guide" - Addison Wesley, 1999. Ali Bahrami, "Object Oriented Systems Development" 1st Edition, The McGraw-Hill Company, 1999 					



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COURSE STRUCTURE & SYLLABI

Course Code	DIGITAL IMAGE AND VIDEO PROCESSING	L	T	P	C
C15803c		3	0	0	3
	Semester	I			
Course Objectives:					
<ul style="list-style-type: none"> To study the image fundamentals and mathematical transforms necessary for image Processing. To study the image enhancement techniques To study image restoration procedures. To study the image compression procedures. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Review the fundamental concepts of a digital image processing system. Analyse images in the frequency domain using various transforms. Evaluate the techniques for image enhancement and image restoration. Categorize various compression techniques 					
UNIT - I					
Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing. Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms					
UNIT - II					
Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering. Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind de-convolution.					
UNIT - III					
Image Segmentation: Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour Image Compression: Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.					
UNIT - IV					
Basic Steps of Video Processing: Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.					
UNIT - V					
2-D Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.					
Textbooks:					



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| <ol style="list-style-type: none">1. Digital Image Processing – Gonzalez and Woods, 3rdEd., Pearson.2. Video Processing and Communication – Yao Wang, JoemOstermann and Ya–quin Zhang.1st Ed., PH Int. |
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Reference Books:
<ol style="list-style-type: none">1. S.Jayaraman, S.Esakkirajan and T.VeeraKumar, "Digital Image processing, TataMcGraw Hill publishers, 2009



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Course Code	DATA SCIENCE	L	T	P	C
C15804a		3	0	0	3
	Semester	I			
Course Objectives:					
<ul style="list-style-type: none"> • Provide you with the knowledge and expertise to become a proficient data scientist. • Demonstrate an understanding of statistics and machine learning concepts that are vital for data science; • Produce Python code to statistically analyse a dataset; • Critically evaluate data visualizations based on their design and use for communicating stories from data; 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> • Explain how data is collected, managed and stored for data science; • Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists; • Implement data collection and management scripts using MongoDB 					
UNIT - I					
Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.					
UNIT - II					
Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources					
UNIT - III					
Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes					
UNIT - IV					
Data visualization: Introduction, Types of data visualisation, Data for visualisation: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings					
UNIT - V					
Applications of Data Science, Technologies for visualisation, Bokeh (Python) Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science					
Textbooks:					
<ol style="list-style-type: none"> 1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press 					
Reference Books:					
<ol style="list-style-type: none"> 1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press, 2013. 2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. O'Reilly, 2013. 3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. Springer, 2009. 4. Avrim Blum, John Hopcroft and RavindranKannan. Foundations of Data Science.2018. 5. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press, 2014. 6. Jiawei Han, MichelineKamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. Morgan Kaufmann, 2011. 					



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COURSE STRUCTURE & SYLLABI

Course Code	DESIGN PATTERNS	L	T	P	C
C15804b		3	0	0	3
	Semester	I			
Course Objectives:					
<ul style="list-style-type: none"> Understand the concept of Design patterns and its importance. Understand the behavioural knowledge of the problem and solutions. Relate the Creational, Structural, behavioral Design patterns. Apply the suitable design patterns to refine the basic design for given context 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Identify the appropriate design patterns to solve objectoriented design problems. Develop design solutions using creational patterns. Apply structural patterns to solve design problems. Construct design solutions by using behavioral patterns. 					
UNIT - I					
Introduction: What Is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.					
UNIT - II					
A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.					
UNIT - III					
Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns. Structural Pattern Part-I: Adapter, Bridge, Composite.					
UNIT - IV					
Structural Pattern Part-II: Decorator, Façade, Flyweight, Proxy. Behavioural Patterns Part-I: Chain of Responsibility, Command, Interpreter, Iterator.					
UNIT - V					
Behavioral Patterns Part-II: Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.					
Textbooks:					
1. Design Patterns By Erich Gamma, Pearson Education					
Reference Books:					
1. Erich Gamma , Richard Helm, Ralph Johnson, John Vlissides , Grady Booch Design Patterns: Elements of Reusable Object-Oriented Software					



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Course Code	INFORMATION SECURITY	L	T	P	C
C15804c		3	0	0	3
Semester		I			
Course Objectives:					
<ul style="list-style-type: none"> To understand basics of Cryptography and Network Security. To be able to secure a message over insecure channel by various means. To learn about how to maintain the Confidentiality, Integrity and Availability of a Data To understand various protocols for network security to protect against the threats in the networks. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Provide security of the data over the network. Do research in the emerging areas of cryptography and network security. Implement various networking protocols. Protect any network from the threats in the world 					
UNIT - I					
Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.					
UNIT - II					
Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.					
UNIT - III					
Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.					
UNIT - IV					
Email privacy: Pretty Good Privacy (PGP) and S/MIME. IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.					
UNIT - V					
Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Basic concepts of SNMP, SNMPv1 Community facility and SNMPv3. Intruders, Viruses and related threats.					
Textbooks:					
<ol style="list-style-type: none"> 1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education. 2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn IdoDubrawsky, Steve W. Manzuik and Ryan Permech, wileyDreamtech, 3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson 					
Reference Books:					
<ol style="list-style-type: none"> 1. Network Security and Cryptography , Bernard Menezes ,Cengage Learning. 2. Cryptography and Security , C.K. Shymala, N. Harini and Dr. T.R. Padmanabhan, Wiley-India. 3. Applied Cryptography, Bruce Schneier, 2nd edition, John Wiley & Sons. 4. Cryptography and Network Security , AtulKahate, TMH. 5. Introduction to Cryptography , Buchmann, Springer. 6. Number Theory in the Spirit of Ramanujan , Bruce C. Berndt, University Press 7. Introduction to Analytic Number Theory , Tom M. Apostol, University Press 					



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COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED DATA STRUCTURES AND ALGORITHMS LAB	L	T	P	C
C15805		0	0	4	2
Semester		I			
Course Objectives:					
<ul style="list-style-type: none"> • Implement linear and non-linear data structures. • Analyze various algorithms based on their time complexity. • Choose appropriate data structure and algorithm design method for a specific application. • Identify suitable data structure to solve various computing problems. 					
Course Outcomes (CO):					
<ul style="list-style-type: none"> • Implement divide and conquer techniques to solve a given problem. • Implement hashing techniques like linear probing, quadratic probing, random probing and double hashing/rehashing. • Perform Stack operations to convert infix expression into post fix expression and evaluate the post fix expression. • Differentiate graph traversal techniques Like Depth First Search, Breadth First Search. Identify shortest path to other vertices using various algorithms. 					
List of Experiments:					
<ul style="list-style-type: none"> • To implement functions of Dictionary using Hashing (division method, Multiplication method, Universal hashing). • To perform various operations i.e., insertions and deletions on AVL trees. • To perform various operations i.e., insertions and deletions on 2-3 trees. • To implement operations on binary heap. • To implement operations on graphs • To implement Depth First Search for a graph non-recursively. • To implement Breadth First Search for a graph non-recursively. • To implement Prim's algorithm to generate a min-cost spanning tree. • To implement Krushkal's algorithm to generate a min-cost spanning tree. • To implement Dijkstra's algorithm to find shortest path in the graph. 					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED COMPUTER NETWORKS LAB	L	T	P	C
C15806		0	0	4	2
	Semester	I			
Course Objectives:					
<ul style="list-style-type: none"> Aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computer networks 					
Course Outcomes (CO):					
Develop programs for client-server applications Perform packet sniffing and analyze packets in network traffic. Implement error detecting and correcting codes Implement network security algorithms					
List of Experiments:					
<ol style="list-style-type: none"> Implementation of client server programs for different network applications Study and analysis of the network using Wireshark network protocol analyser Implementation of topology generation for network simulation Implementation of queuing management Implementation of MAC-layer protocols Implementation of routing protocols Implementation of transport-layer protocols Implementation of network security mechanisms 					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	RESEARCH METHODOLOGY AND IPR	L	T	P	C
C15807		2	0	0	2
Semester		I			
Course Objectives:					
<ul style="list-style-type: none"> Identify an appropriate research problem in their interesting domain. Understand ethical issues understand the Preparation of a research project thesis report. Understand the Preparation of a research project thesis report Understand the law of patent and copyrights. Understand the Adequate knowledge on IPR 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Analyze research related information Follow research ethics Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits. 					
UNIT - I					
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, scope, and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations					
UNIT - II					
Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.					
UNIT - III					
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.					
UNIT - IV					
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.					
UNIT - V					
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.					
Textbooks:					
<ol style="list-style-type: none"> 1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students" 2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction" 					
Reference Books:					



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COURSE STRUCTURE & SYLLABI

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.



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COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED OPERATING SYSTEMS	L	T	P	C
C15809		3	0	0	3
	Semester	II			
Course Objectives:					
<ul style="list-style-type: none"> To be able to read and understand sample open-source programs and header files. System calls which explore networking and security Applications. To acquire the knowledge in the implementation of interprocess communication. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> To explain the functionality of a large software system by reading its source. To revise any algorithm present in a system. Inter process communication mechanism Android mobiles inner process system 					
UNIT - I					
Basic Operating System Concepts - Overview of Unix File System - Files - Links - Types - Inodes -Access Rights - System Calls - Overview of Unix Kernels -Model - Implementation - Reentrant Kernels - Address Space - Synchronization - Interprocess Communication - Process Management - Memory Management - Device Drivers.					
UNIT - II					
Processes, Lightweight Processes, and Threads - Process Descriptor - State - Identifying a Process - Relationships among processes - Organization - Resource Limits - Creating Processes - System Calls - Kernel Threads - Destroying Processes -Termination - Removal.					
UNIT - III					
The Virtual File System (VFS) - Role - File Model -System Calls - Data Structures - Super Block, Inode, File, dentry Objects - dentry Cache - Files Associated with a Process - Filesystem Types - Special Files systems – Filesystem Type Registration – Filesystem Handling - Namespaces - Mounting – Unmounting - Implementation of VFS System Calls.					
UNIT - IV					
Windows Operating system - versions, Concepts and tools, Windows internals, System Architecture, Requirements and design goals, Operating system model, Architecture overview. Key system components. System mechanisms - Trap dispatching, object manager, Synchronization, System worker threads, Windows global flags, Local procedural calls, Kernelevent tracing.					
UNIT - V					
what is android, basic building blocks – activities, services, broadcast receivers & content, ui components- views & notifications, components for communication - intents & intent filters, android api levels launching emulator editing emulator settings emulator shortcuts log cat usage, Applications of Android.					
Textbooks:					
<ol style="list-style-type: none"> Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel", 3rd Edition, O'Reilly Publications, 2005. Harold Abelson, Gerald Jay Sussman and Julie Sussman, —Structure and Interpretation of Computer Programs , Second Edition, Universities Press, 2013. 					
Reference Books:					
<ol style="list-style-type: none"> Mark E. Russinovich and David A. Solomon, Microsoft Windows Internals, 4th Edition, Microsoft Press, 2004. 					



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COURSE STRUCTURE & SYLLABI

Course Code	APPLICATIONS OF AI	L	T	P	C
C15810		3	0	0	3
Semester		II			
Course Objectives:					
<ul style="list-style-type: none"> To impart knowledge about Applications of Artificial Intelligence. To give understanding of the main abstractions and reasoning for intelligent systems. To enable the students to understand the basic principles of Artificial Intelligence in various applications 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Understand and apply the principles of AI. Solve basic AI based problems. Define the concept of Artificial Intelligence. Apply AI techniques to real-world problems to develop intelligent systems. Select appropriately from a range of techniques when implementing intelligent systems. 					
UNIT - I	AI for Driverless systems				
<p>Look: The MEMEX Reloaded, Inside a Search Engine, Google and the Mind, Deeper and Darker. The Robotic chauffeur: Getting to driverless, A Cure for the deadliest disease, Seven delaying Myths, The timeline.</p> <p>A Driverless World: Friction-free personal mobility, Parking, Commuting, Take the pod – meet people, Anatomy of a Driverless cars: High definition digital maps, Digital Cameras, Light detection and ranging(lidar), Radio Detection and Ranging (Radar), Ultrasonic sensors(sonars), Global positioning systems (GPS), The inner ear (IMU), Drive by wire.</p>					
UNIT - II	AI for Marketing				
<p>Solving the Marketing Problem: - One-to-One Marketing, One-to-Many Advertising, The Four Ps, What Keeps a Marketing Professional Awake? The Customer Journey, We Will Never Really Know, How Do I Connect? Let Me Count the Ways, Why Do I Connect? Branding, Marketing Mix Modelling, Econometrics, Customer Lifetime Value, One-to-One Marketing—The Meme, Seat-of-the-Pants Marketing, Marketing in a Nutshell, What Seems to Be the Problem?</p>					
UNIT - III	AI for Marketing continued				
<p>Using AI to Get Their Attention - Market Research: Whom Are We After? , Marketplace Segmentation, Raising Awareness, Social Media Engagement, In Real Life, The B2B World, Using AI to Persuade - The In-Store Experience, On the Phone, The Onsite Experience—Web Analytics, Merchandising, Closing the Deal, Back to the Beginning: Attribution.</p>					
UNIT - IV	AI for Customers				
<p>Using AI for Retention - Growing Customer Expectations, Retention and Churn, Many Unhappy Returns, Customer Sentiment, Customer Service, Predictive Customer Service</p>					
UNIT - V	AI for Image processing	Lecture Hrs:			
<p>The role of medical image computing and machine learning in health care, Deep Learning and Machine Learning in Imaging: Basic Principles, how to develop Artificial Intelligence Applications, A Standardized Approach for preparing Imaging data for Machine Learning tasks in Radiology, Artificial Intelligence in Medicine: Validation and Study Design, Enterprise Imaging.</p>					
Textbooks:					



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COURSE STRUCTURE & SYLLABI

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| <ol style="list-style-type: none">1. Gautam Shroff "The Intelligent Web", OXFORD University Press, 2013.2. Hod Lipson, and Melba kurman, "Driverless_ Intelligent cars and the Road Ahead", The MIT Press Cambridge, Massachusetts London, England, 2016. |
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Reference Books:

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| <ol style="list-style-type: none">1. Jim Sterne "Artificial intelligence for Marketing", John Wiley & sons, 2017.2. Erik R. Ranschaert, sergey Morozov, Paul R. Algra, "Artificial Intelligence in Medical Imaging, Springer Nature Switzerland AG, 2019 |
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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	Block Chain Technology and Applications	L	T	P	C
C15811a		3	0	0	3
	Semester	II			
Course Objectives:					
<ul style="list-style-type: none"> Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them Design, build, and deploy smart contracts and distributed applications, Integrate ideas from block chain technology into their own projects. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding. Identify the risks involved in building Block chain applications. Review of legal implications using smart contracts. Choose the present landscape of Blockchain implementations and Understand Crypto currency markets Examine how to profit from trading crypto currencies. 					
UNIT - I	Introduction				
Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain. Evolution of Blockchain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.					
UNIT - II	Blockchain Concepts				
Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.					
UNIT - III	Architecting Blockchain solutions				
Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.					
UNIT - IV	Ethereum Block chain Implementation				
Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Ether scan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppelin in Contracts					
UNIT - V	Hyper ledger Block chain Implementation				
Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chain code Functions Using Client Application. Advanced Concepts in Blockchain: Introduction, Inter Planetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.					



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COURSE STRUCTURE & SYLLABI

Textbooks:
1. Ambadas, Arshad SarfarzAriff, Sham “Blockchain for Enterprise Application Developers”, Wiley, 2020 2. Andreas M. Antonopoulos, “Mastering Bitcoin: Programming the Open Blockchain”, O’Reilly, 2017
Reference Books:
1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill. 2. Blockchain: Blueprint for a New Economy, Melanie Swan, O’Reilly
Online Learning
https://github.com/blockchainedindia/resources



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
C15811b		3	0	0	3
	Semester	II			
Course Objectives:					
<ul style="list-style-type: none"> Understand SOA and evolution of SOA. Understand web services and primitive, contemporary SOA. Understand various service layers. Understand service-oriented analysis and design based on guidelines. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Comprehend the need for SOA and its systematic evolution Apply SOA technologies to enterprise domain Design and analyse various SOA patterns and techniques Compare and evaluate best strategies and practices of SOA 					
UNIT - I					
Introducing SOA: Fundamental SOA, Common Characteristics of Contemporary SOA, Common Tangible Benefits of SOA, Common Pitfalls of Adopting SOA. The Evolution of SOA: An SOA Timeline, The Continuing Evolution of SOA, The Roots of SOA.					
UNIT - II					
Web Services and Primitive SOA: The Web Services Frame Work, Services, Service Descriptions, Messaging. Web Services and Contemporary SOA (Part I-Activity management and Composition): Message Exchange Patterns, Service Activity, Coordination, Atomic Transactions, Orchestration, and Choreography. Web Services and Contemporary SOA (Part-II-Advanced Messaging, Metadata and Security): Addressing, Reliable Messaging, Correlation, Policies, Metadata exchange, Security.					
UNIT - III					
Principles of Service-Oriented: Service–Orientation and the Enterprise, Anatomy of SOA, Common Principles of Service–Orientation, Interrelation between Principles of Service- Orientation, Service Orientation and Object Orientation, Native Web Services Support for Principles of Service-Oriented. Service Layers: Service-Oriented and Contemporary SOA, Service Layer abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration Scenarios.					
UNIT - IV					
SOA Delivery Strategies: SOA Delivery Lifecycle Phases, The Top-Down Strategy, The Bottom-up Strategy, The Agile Strategy. Service Oriented Analysis (Part I-Introduction): Introduction to Service Oriented Analysis, Benefits of a Business Centric SOA, Deriving Business Services. Service Oriented Analysis (Part-II-Service Modelling): Service Modelling, Service Modelling Guidelines, Classifying Service Model Logic, Contrasting Service Modelling Approaches. Service Oriented Design (Part I-Introduction): Introduction to Service-Oriented Design, WSDL Related XML Schema Language Basics, WSDL Language Basics, Service Interface Design Tools. Service Oriented Design (Part II-SOA Composition Guidelines): SOA Composing Steps, Considerations for Choosing Service Layers, Considerations for Positioning Core SOA Standards, Considerations for Choosing SOA Extensions.					
UNIT - V					
Service Oriented Design (Part III- Service Design): Service Design Overview, Entity- Centric Business Service Design, Application Service Design, Task-Centric Business Service Design, Service Design Guidelines. Service Oriented Design (Part IV-Business Process Design): WS-BPEL Language Basics, WS- Coordination Overview, Service Oriented Business Process Design.					
Textbooks:					



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COURSE STRUCTURE & SYLLABI

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|---|
| <ol style="list-style-type: none">1. Service-Oriented Architecture-Concepts, Technology, and Design, Thomas Erl, Pearson Education, 2006.2. Understanding SOA with Web Services, Eric Newcomer, Greg Lomow, Pearson Education, 2005. |
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Reference Books:

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| <ol style="list-style-type: none">1. Thomas Erl; Service Oriented Architecture Concepts Technology & Design, Pearson Education Limited; 2015, ISBN-13: 9788131714904.2 Guido Schmutz, Peter Welkenbach, Daniel Liebhart; Service Oriented Architecture An Integration Blueprint; Shroff Publishers & Distributors; 2010, ISBN-13: 9789350231081 |
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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	COMPUTER VISION (Common to M.Tech CSE, AI & ML)	L	T	P	C
C15811c		3	0	0	3
Semester		II			
Course Objectives:					
<ul style="list-style-type: none"> • Be familiar with both the theoretical and practical aspects of computing with images. • Have described the foundation of image formation, measurement, and analysis. • Understand the geometric relationships between 2D images and the 3D world. • Grasp the principles of state-of-the-art deep neural networks 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> • Develop the practical skills necessary to build computer vision applications. • To have gained exposure to object and scene recognition and categorization from images 					
UNIT - I	Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis				
UNIT - II	Edge detection, Edge detection performance, Hough transform, corner detection				
UNIT - III	Segmentation, Morphological filtering, Fourier transform				
UNIT - IV	Feature extraction, shape, histogram, colour, spectral, texture, using CVIPtools, Feature analysis, feature vectors, distance /similarity measures, data pre-processing				
UNIT - V	Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi supervised Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods				
Textbooks:					
1. Computer Vision: Algorithms and Applications by Richard Szeliski.					
Reference Books:					
1. Deep Learning, by Goodfellow, Bengio, and Courville. 2. Dictionary of Computer Vision and Image Processing, by Fisher et al.					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	DATA VISUALIZATION TECHNIQUES	L	T	P	C
C15812a		3	0	0	3
Semester		II			
Course Objectives:					
<ul style="list-style-type: none"> • To develop skills to both design and critique visualizations. • To introduce visual perception and core skills for visual analysis. • To understand visualization for time-series analysis. • To understand visualization for ranking analysis. • To understand visualization for deviation analysis.. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> • Explain principles of visual perception • Apply core skills for visual analysis • Apply visualization techniques for various data analysis tasks • Design information dashboard 					
UNIT - I					
Information visualization – effective data analysis – traits of meaningful data – visual perception – making abstract data visible – building blocks of information visualization – analytical interaction – analytical navigation – optimal quantitative scales – reference lines and regions – trellises and crosstabs – multiple concurrent views – focus and context – details on demand – over-plotting reduction – analytical patterns – pattern examples.					
UNIT - II					
Distribution analysis – describing distributions – distribution patterns – distribution displays – distribution analysis best practices – correlation analysis – describing correlations – correlation patterns – correlation displays – correlation analysis techniques and best practices – multivariate analysis – multivariate patterns – multivariate displays – multivariate analysis techniques and best practices.					
UNIT - III					
Information dashboard – Introduction– dashboard design issues and assessment of needs – Considerations for designing dashboard-visual perception – Achieving eloquence.					
UNIT - IV					
Advantages of Graphics _Library of Graphs – Designing Bullet Graphs – Designing Sparklines – Dashboard Display Media –Critical Design Practices – Putting it all together- Unveiling the dashboard.					
UNIT - V					
Plotting Geospatial Data: Introduction to Geoplotlib, Design Principles of Geoplotlib, Geospatial Visualizations, Plotting Geospatial Data on a Map Web-Based Visualizations: Concepts of Bokeh, Interfaces-Plotting and Model Interfaces, Output, Bokeh Server, Presentation, Integrating – HTML Document and Bokeh Applications					
Textbooks:					
<ol style="list-style-type: none"> 1. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008. 2. Mario Dobler, Tim Grobmann, "Data Visualization with Python", O'Reilly, First Edition, 2019 					
Reference Books:					
<ol style="list-style-type: none"> 1. Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013. 					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	DISTRIBUTED SYSTEMS			L	T	P	C
C15812b				3	0	0	3
Semester				II			
Course Objectives:							
To introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment, and to provide insight into related research problems							
Course Outcomes (CO): Student will be able to							
<ul style="list-style-type: none"> • Design trends in distributed systems. • Apply network virtualization. • Apply remote method invocation and objects 							
UNIT - I							
Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues							
UNIT - II							
DISTRIBUTED DATABASE DESIGN Alternative design strategies; Distributed design issues; Fragmentation; Data Allocation SEMANTICS DATA CONTROL View management; Data security; Semantic Integrity Control QUERY PROCESSING ISSUES Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data							
UNIT - III							
Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms TRANSACTION MANAGEMENT The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models CONCURRENCY CONTROL Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management							
UNIT - IV							
Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols							
UNIT - V							
PARALLEL DATABASE SYSTEMS Parallel architectures; parallel query processing and optimization; load balancing ADVANCED TOPICS Mobile Databases, Distributed Object Management, Multi-databases							
Textbooks:							
1. Principles of Distributed Database Systems, M.T. Oszu and P. Valduriez, Prentice-Hall, 1991.							
Reference Books:							
1. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992.							



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	PRIVACY PRESERVING DATA PUBLISHING	L	T	P	C
C15812c		3	0	0	3
	Semester	II			
Course Objectives:					
<ul style="list-style-type: none"> Will be able to decide, given an application, if it should be formulated as a data privacy problem. If yes, the students will be able to formally define the problem and state what properties can be guaranteed by applying differential privacy. Will have understanding of how (and why) randomness (or uncertainty) provides privacy protection. Will be able to analyse real-world privacy problems, identify which privacy-preserving methods are appropriate, and implement the private algorithms in code. Will be able to evaluate and compare privacy-preserving algorithms. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Apply anonymization methods for sensitive data protection Apply state-of-art techniques for data privacy protection Design privacy preserving algorithms for real-world applications Identify security and privacy issues in OLAP systems Apply information metrics for Maximizing the preservation of information in the anonymization process 					
UNIT - I	Fundamentals of defining privacy and developing efficient algorithms for enforcing privacy, challenges in developing privacy preserving algorithms in real-world applications, privacy issues, privacy models,				
UNIT - II	Anonymization operations, information metrics, Anonymization methods for the transaction data, trajectory data, social networks data, and textual data, Collaborative Anonymization,				
UNIT - III	Access control of outsourced data, Use of Fragmentation and Encryption to Protect Data Privacy, Security and Privacy in OLAP systems.				
UNIT - IV	Extended Data publishing Scenarios, Anonymization for Data Mining, publishing social science data,				
UNIT - V	Continuous user activity monitoring (like in search logs, location traces, energy monitoring), social networks, recommendation engines and targeted advertising.				
Textbooks:					
1. Benjamin C.M. Fung, Ke Wang, Ada Wai-Chee Fu and Philip S. Yu, Introduction to PrivacyPreserving Data Publishing: Concepts and Techniques, 1st Edition, Chapman & Hall/CRC, 2010.					
Reference Books:					
1. Bee-Chung Chen, Daniel Kifer, AshwinMachanavajjhala, Kristen LeFevre Privacy-Preserving Data Publishing, Now Publishers Inc, 2009.					



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COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED OPERATING SYSTEMS LAB	L	T	P	C
C15813		0	0	4	2
	Semester	II			
Course Objectives:					
<ul style="list-style-type: none"> To study Linux memory management data structures and algorithms. To acquire the knowledge in the implementation of interprocess communication. To understand how program execution happens in Linux. 					
Course Outcomes (CO):					
<ul style="list-style-type: none"> To revise any algorithm present in a system. To design a new algorithm to replace an existing one. To appropriately modify and use the data structures of the linux kernel for a different software system 					
List of Experiments:					
<ol style="list-style-type: none"> Write programs using the following system calls of UNIX operating system: 40 fork, exec, getpid, exit, wait, close, stat, opendir, readdir Write programs using the I/O system calls of UNIX operating system (open, read, write, etc) Write C programs to simulate UNIX commands like ls, grep, etc. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time. (2 sessions) Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time. (2 sessions) Developing Application using Inter Process communication (using shared memory, pipes or message queues) Implement the Producer – Consumer problem using semaphores (using UNIX system calls). 					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	APPLICATIONS OF AI LAB	L	T	P	C
C15814		0	0	4	2
Semester		II			
Course Objectives:					
<ul style="list-style-type: none"> To have an appreciation for and understanding of both the achievements of AI and the theory underlying those achievements. To have an appreciation for the engineering issues underlying the design of AI systems To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language. To understand the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs. 					
Course Outcomes (CO):					
<ul style="list-style-type: none"> Develop systems that process unstructured, uncurated data automatically using artificial intelligence (AI) frameworks and platforms. Determine the framework in which AI bots may function, including interactions with users and environments. Design and implement cognitive automation for different industries. 					
List of Experiments:					
<p>1. Maps and Navigation AI has drastically improved traveling. Instead of having to rely on printed maps or directions, you can now use Google Maps on your phone and type in your destination. So how does the application know where to go? And what's more, the optimal route, road barriers, and traffic congestions? Not too long ago, only satellite-based GPS was available, but now, artificial intelligence is being incorporated to give users a much more enhanced experience</p> <p>2. Facial Detection and Recognition A. Design an application that can be used for Face detection. B. Design an application that can identify the face.</p> <p>3. Text Editors or Autocorrect A. Design an algorithm that can give autosuggestions in a word processor. B. Design an algorithm to detect spelling and grammar errors in a text document.</p> <p>4. Search and Recommendation Algorithms Design a recommender system which keeps track of the previous shopping data of the user and recommends other products based on his interests.</p> <p>5. Chatbots A. Design an AI chatbot which provides information about your college. B. Design an AI chatbot which permits the user to install a software of your choice</p> <p>6. Digital Assistants Design a Digital assistant of your choice. Example is the digital assistant which plays a song when you say play song xxx.mp3.</p> <p>7. Social Media Design an application which detects Fake news. Design an application which finds most viewed news.</p> <p>8. Image Processing: Design an application which detects the emotion of the person in an image.</p>					
Online Resources: 1. AI and Improving the Customer Experience Pega					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	SOFTWARE DEFINED NETWORKS	L	T	P	C
C15817a		3	0	0	3
Semester		III			
Course Objectives:					
<ul style="list-style-type: none"> This course introduces about software defined networking, an emerging paradigm in computer networking that allows a logically centralized software program to control the behavior of an entire network. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Differentiate between traditional networks and software defined networks and understand the key benefits and use cases of SDN. Interpret the SDN data plane devices and OpenFlow Protocols Implement the operation of SDN control plane with different controllers Apply techniques that enable applications to control the underlying network using SDN Evaluate Network Functions Virtualization components and their roles in SDN 					
UNIT - I					
Evolving network requirements-The SDN Approach: Requirements, SDN Architecture, Characteristics of Software-Defined Networking, SDN and NFV-Related Standards: Standards-Developing Organizations, Industry Consortia, Open Development Initiatives.					
UNIT - II					
SDN data plane: Data plane Functions, Data plane protocols, Open flow logical network Device: Flow table Structure, Flow Table Pipeline, The Use of Multiple Tables, Group Table- Open Flow Protocol.					
UNIT - III					
SDN Control Plane Architecture: Control Plane Functions, Southbound Interface, Northbound Interface, Routing, ITU-T Model- OpenDaylight-REST- Cooperation and Coordination Among Controllers					
UNIT - IV					
SDN Application Plane Architecture: Northbound Interface, Network Applications, User Interface- Network Services Abstraction Layer: Abstractions in SDN, Frenetic- Traffic Engineering Measurement and Monitoring Security- Data CentreNetworking- Mobility and Wireless.					
UNIT - V					
Background and Motivation for NFV- Virtual Machines- NFV Concepts: Simple Example of the Use of NFV, NFV Principles, High-Level NFV Framework, NFV Benefits and Requirements- NFV Reference Architecture: NFV Management and Orchestration					
Textbooks:					
<ol style="list-style-type: none"> Paul Goransson Chuck Black Timothy Culver: Software Defined Networks: A Comprehensive Approach, Morgan Kaufmann, 2016. Ken Gray Thomas Nadeau: Network Function Virtualization, Morgan Kaufmann, 2016. 					
Reference Books:					
<ol style="list-style-type: none"> Larry Peterson , Carmelo Cascone , Bruce Davie: Software-Defined Networks: A Systems Approach, Systems Approach, 2021 					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	REINFORCEMENT LEARNING	L	T	P	C
C15817b		3	0	0	3
	Semester	III			
Course Objectives:					
<ul style="list-style-type: none"> Reinforcement Learning is a subfield of Machine Learning, but is also a general-purpose formalism for automated decision-making and AI. This course introduces you to statistical learning techniques where an agent explicitly takes actions and interacts with the world. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Formulate Reinforcement Learning problems Apply various Tabular Solution Methods to Markov Reward Process Problems Apply various Iterative Solution methods to Markov Decision Process Problems Comprehend Function approximation methods 					
UNIT - I					
Introduction: Introduction to Reinforcement Learning (RL) – Difference between RL and Supervised Learning, RL and Unsupervised Learning. Elements of RL, Markov property, Markov chains, Markov reward process (MRP).					
UNIT - II					
Evaluative Feedback - Multi-Arm Bandit Problem: An n-Armed Bandit Problem, Exploration vs Exploitation principles, Action value methods, Incremental Implementation, tracking a non-stationary problem, optimistic initial values, upper-confidence-bound action selection, Gradient Bandits. Introduction to and proof of Bellman equations for MRPs					
UNIT - III					
Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations. Dynamic Programming (DP): Overview of dynamic programming for MDP, principle of optimality, Policy Evaluation, Policy Improvement, policy iteration, value iteration, asynchronous DP, Generalized Policy Iteration.					
UNIT - IV					
Monte Carlo Methods for Prediction and Control: Overview of Monte Carlo methods for model free RL, Monte Carlo Prediction, Monte Carlo estimation of action values, Monte Carlo Control, On policy and off policy learning, Importance sampling. Temporal Difference Methods: TD Prediction, Optimality of TD(0), TD Control methods - SARSA, Q-Learning and their variants.					
UNIT - V					
Eligibility traces: n-Step TD Prediction, Forward and Backward view of TD(λ), Equivalence of forward and backward view, Sarsa(λ), Watkins's Q(λ), Off policy eligibility traces using importance of sampling. Function Approximation Methods: Value prediction with function approximation, gradient descent methods, Linear methods, control with function approximation.					
Textbooks:					
<ol style="list-style-type: none"> Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction", 2nd Edition, The MIT Press. CsabaSzepesvari – Algorithms for Reinforcement Learning – Morgan & Claypool, 2010. 					
Reference Books:					
<ol style="list-style-type: none"> Reinforcement Learning By Richard S. (University Of Alberta) Sutton, Andrew G. (Co-Director Autonomous Learning Laboratory) Barto 					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	Generative AI and Large Language Model	L	T	P	C
C15817c		3	0	0	3
Semester		III			
Course Objectives:					
<ul style="list-style-type: none"> To explore the fundamental concepts of data analytics. To learn the principles and methods of statistical analysis Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms. To understand the various search methods and visualization techniques. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Understand the ideas of statistical approaches to learning Understand the significance of exploratory data analysis (EDA) in data science and apply basic tools (plots, graphs, summary statistics) to perform EDA Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modeling. Explore the merits of Naive Bayes technique Recognize the characteristics of machine learning techniques that are useful to solve real-world problems 					
UNIT - I	Introduction to Generative AI and Large Language Models (LLMs)				
Content: Overview of Generative AI and its significance in various industries, fundamental concepts of Generative AI, introduction to large language models (LLMs), the impact of LLMs on content generation and data handling, and the evolution and development of LLMs.					
UNIT - II	Transformers Architecture and Techniques for Guiding LLMs				
Understanding the key components of the transformers architecture, the role of transformers in language generation, prompt engineering techniques, instruction fine-tuning for generating desired outputs, and parameter-efficient fine-tuning (PEFT) for optimized model adaptation.					
UNIT - III	Enhancing LLM Performance and Applications				
Reinforcement learning with human feedback for improving LLM performance, LLM-powered applications including text and image generation, creative applications, retrieval-augmented generation (RAG) and its potential, and the role of LLMs in various business sectors.					
UNIT - IV	Generative Image Models and Development Frameworks				
Overview of generative image models such as autoencoders, GANs, diffusion models, and OpenAI CLIP, LangChain framework for developing applications using LLMs, training and deployment strategies for LLMs, and case studies demonstrating these technologies in real-world scenarios.					
UNIT - V	Responsible AI and Ethical Considerations				
Ethical considerations in Generative AI, strategies for mitigating biases, responsible AI practices, the importance of ethics in AI development, and real-world applications of Generative AI and LLMs, including detailed case studies.					
Textbooks:					
1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Third Edition and other reference shared in separate document"					



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COURSE STRUCTURE & SYLLABI

Reference Books:

1. **Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play** by David Foster, published by O'Reilly Media in 2019.
2. **Deep Learning with Python** by François Chollet, published by Manning Publications in 2017



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COURSE STRUCTURE & SYLLABI

AUDIT COURSE-I

Course Code	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
C15808a			2	0	0
Semester		I			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> • Understand the essentials of writing skills and their level of readability • Learn about what to write in each section • Ensure qualitative presentation with linguistic accuracy 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> • Understand the significance of writing skills and the level of readability • Analyze and write title, abstract, different sections in research paper • Develop the skills needed while writing a research paper 					
UNIT - I					
1 Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity					
UNIT - II					
Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization					
UNIT - III					
Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion- Conclusions-Recommendations.					
UNIT - IV					
Key skills needed for writing a Title, Abstract, and Introduction					
UNIT - V					
Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions					
Suggested Reading					
<ol style="list-style-type: none"> 1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I] 2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press 3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook 4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011 					



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COURSE STRUCTURE & SYLLABI

Course Code	DISASTER MANAGEMENT	L	T	P	C
C15808b			2	0	0
Semester		I			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response. Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in 					
UNIT - I					
<p>Introduction: Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.</p> <p>Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics</p>					
UNIT - II					
<p>Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.</p>					
UNIT - III					
<p>Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.</p>					
UNIT - IV					
<p>Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.</p>					
UNIT - V					
<p>Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.</p>					

Suggested Reading



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COURSE STRUCTURE & SYLLABI

1. R.Nishith,SinghAK,“DisasterManagementinIndia:Perspectives,issuesandstrategies
2. “New Royal book
Company..Sahni,PardeepEt.Al.(Eds.),”DisasterMitigationExperiencesAndReflections”,PrenticeHall OfIndia, New Delhi.
3. GoelS.L.,DisasterAdministrationAndManagementTextAndCaseStudies”,Deep&Deep
Publication Pvt. Ltd., New Delhi



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COURSE STRUCTURE & SYLLABI

Course Code	SANSKRITFOR TECHNICAL KNOWLEDGE	L	T	P	C
C15808c		2	0	0	0
Semester		I			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> • To get a working knowledge in illustrious Sanskrit, the scientific language in the world • Learning of Sanskrit to improve brain functioning • Learning of Sanskrit to develop the logic in mathematics, science&othersubjects enhancing the memory power • The engineering scholars equipped with Sanskrit will be able to explore the huge • Knowledge from ancientsliterature 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> • Understanding basic Sanskrit language • Ancient Sanskrit literature about science &technology can be understood • Being a logical language will help to develop logic in students 					
UNIT - I					
Alphabets in Sanskrit,					
UNIT - II					
Past/Present/Future Tense, Simple Sentences					
UNIT - III					
Order, Introduction of roots					
UNIT - IV					
Technical information about Sanskrit Literature					
UNIT - V					
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics					
Suggested Reading					
<ol style="list-style-type: none"> 1. "Abhyaspustakam" –Dr. Vishwas, Sanskrit-Bharti Publication, New Delhi 2. "Teach Yourself Sanskrit" Prathama Deeksha- VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New Delhi Publication 3. "India's Glorious ScientificTradition" Suresh Soni, Ocean books (P) Ltd.,New Delhi 					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

AUDIT COURSE-II

Course Code	PEDAGOGY STUDIES	L	T	P	C
C15816a		2	0	0	0
Semester		II			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers. Identify critical evidence gaps to guide the development. 					
Course Outcomes (CO): Student will be able to					
Students will be able to understand: <ul style="list-style-type: none"> What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries? What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners? How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? 					
UNIT - I					
Introduction and Methodology: Aims and rationale, Policy back ground, Conceptual frame work and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and searching.					
UNIT - II					
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.					
UNIT - III					
Evidence on the effectiveness of pedagogical practices, Methodology for the in-depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.					
UNIT - IV					
Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes					
UNIT - V					
Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.					



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Suggested Reading

1. AckersJ,HardmanF(2001)ClassroominteractioninKenyanprimarieschools,Compare, 31 (2): 245-261.
3. AgrawalM(2004)Curricularreforminschools:Theimportanceofevaluation,Journalof Curriculum Studies, 36 (3): 361-379.
4. AkyeamongK(2003) Teacher training in Ghana - does it count? Multi-site teachereducation research project (MUSTER) country report 1. London: DFID.
5. Akyeamong K, LussierK, PryorJ, Westbrook J (2013)Improving teaching and learning of basic maths and reading in Africa: Does teacherpreparation count?International Journal Educational Development, 33 (3): 272–282.
6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
- Chavan M (2003)ReadIndia: A mass scale, rapid, ‘learning to read’ campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.



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COURSE STRUCTURE & SYLLABI

Course Code	STRESS MANAGEMENT BY YOGA	L	T	P	C
C15816b			2	0	0
Semester		II			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> To achieve overall health of body and mind To overcome stress 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Develop healthy mind in a healthy body thus improving social health also Improve efficiency 					
UNIT - I					
Definitions of Eight parts of yog.(Ashtanga)					
UNIT - II					
Yam and Niyam.					
UNIT - III					
Do's and Don't's in life. i) Ahimsa, satya, asthaya, bramhacharya and aparigraha Shaucha, santosh, tapa, swadhyay, ishwarpranidhan					
UNIT - IV					
Asan and Pranayam					
UNIT - V					
i) Various yogposes and their benefits for mind & body ii) Regularization of breathing techniques and its effects-Types of pranayam					
Suggested Reading					
1. 'Yogic Asanas for Group Training-Part-I': Janardan Swami Yogabhyasi Mandal, Nagpur 2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata					



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COURSE STRUCTURE & SYLLABI

Course Code	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	T	P	C
C15816c		2	0	0	0
Semester		II			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> • To learn to achieve the highest goal happily • To become a person with stable mind, pleasing personality and determination • To awaken wisdom in students 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> • Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life • The person who has studied Geeta will lead the nation and mankind to peace and prosperity • Study of Neetishatakam will help in developing versatile personality of students 					
UNIT - I					
Neetisatakam- Holistic development of personality Verses-19,20,21,22(wisdom) Verses-29,31,32(pride & heroism) Verses-26,28,63,65(virtue)					
UNIT - II					
Neetisatakam- Holistic development of personality Verses-52,53,59(dont's) Verses-71,73,75,78(do's)					
UNIT - III					
Approach to day-to-day work and duties. Shrimad Bhagwad Geeta: Chapter2-Verses41,47,48, Chapter3-Verses13,21,27,35,Chapter6-Verses5,13,17,23,35, Chapter18-Verses45,46,48.					
UNIT - IV					
Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56,62,68 Chapter12 -Verses13,14,15,16,17,18 Personality of Role model. Shrimad Bhagwad Geeta:					
UNIT - V					
Chapter2-Verses 17,Chapter3-Verses36,37,42, Chapter4-Verses18,38,39 Chapter18- Verses37,38,63					
Suggested Reading					
<ol style="list-style-type: none"> 1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata 2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P. Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi. 					



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COURSE STRUCTURE & SYLLABI

OPEN ELECTIVE

Course Code	INDUSTRIAL SAFETY	L	T	P	C
C15818a		3	0	0	3
Semester		III			
Course Objectives:					
<ul style="list-style-type: none"> To know about Industrial safety programs and toxicology, Industrial laws, regulations and source models To understand about fire and explosion, preventive methods, relief and its sizing methods To analyse industrial hazards and its risk assessment. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> To list out important legislations related to health, Safety and Environment. To list out requirements mentioned in factories act for the prevention of accidents. To understand the health and welfare provisions given in factories act. 					
UNIT - I					
Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.					
UNIT - II					
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.					
UNIT - III					
Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.					
UNIT - IV					
Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.					
UNIT - V					
Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance					



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COURSE STRUCTURE & SYLLABI

Textbooks:
<ol style="list-style-type: none">1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
Reference Books:
<ol style="list-style-type: none">1. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.



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COURSE STRUCTURE & SYLLABI

Course Code	BUSINESS ANALYTICS	L	T	P	C
C15818b		3	0	0	3
	Semester	III			
Course Objectives:					
<ul style="list-style-type: none"> The main objective of this course is to give the student a comprehensive understanding of business analytics methods. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Students will demonstrate knowledge of data analytics. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making. Students will demonstrate the ability to translate data into clear, actionable insights. 					
UNIT - I					
Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.					
UNIT - II					
Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.					
UNIT - III					
Forming Requirements: Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents. Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling					
UNIT - IV					
Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools					
UNIT - V					
Recent Trands in: Embedded and colleborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.					
Textbooks:					
<ol style="list-style-type: none"> Business Analysis by James Cadle et al. Project Management: The Managerial Process by Erik Larson and, Clifford Gray 					
Reference Books:					
<ol style="list-style-type: none"> Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press. Business Analytics by James Evans, persons Education. 					



RAVINDRA COLLEGE OF ENGINEERING FOR WOMEN

(autonomous)

M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	OPTIMIZATION TECHNIQUES	L	T	P	C
C15818c		3	0	0	3
	Semester	III			
Course Objectives:					
<ul style="list-style-type: none"> Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems. Learn classical optimization techniques and numerical methods of optimization. Know the basics of different evolutionary algorithms. Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems. Use classical optimization techniques and numerical methods of optimization. Describe the basics of different evolutionary algorithms. Enumerate fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas 					
UNIT - I					
LINER PROGRAMMING (L.P): Revised Simplex Method, Dual simplex Method, Sensitivity Analysis DYNAMIC PROGRAMMING (D.P): Multistage decision processes. Concepts of sub optimization, Recursive Relation-calculus method, tabular method, LP as a case of D.P.					
UNIT - II					
CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization without constraints, Multi variable optimization without constraints, multivariable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions. NUMERICAL METHODS FOR OPTIMIZATION: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method					
UNIT - III					
MODERN METHODS OF OPTIMIZATION: GENETIC ALGORITHM (GA): Differences and similarities between conventional and evolutionary algorithms, working principle, Genetic Operators- reproduction, crossover, mutation GENETIC PROGRAMMING (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, Random population generation. Fuzzy Systems: Fuzzy set Theory, Optimization of Fuzzy systems					
UNIT - IV					
INTEGER PROGRAMMING: Graphical Representation, Gomory's Cutting Plane Method, Balas' Algorithm for Zero-One Programming, Branch-and-Bound Method					
UNIT - V					
APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS: Formulation of model- optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.					
Textbooks:					



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COURSE STRUCTURE & SYLLABI

1. Engineering Optimization (4th Edition) by S.S.Rao, New Age International,

Reference Books:

1. Optimization for Engineering Design by Kalyanmoy Deb, PHI Publishers
2. Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers
3. Operations Research by Hillar and Liberman, TMH Publishers
4. Optimal design – JasbirArora, McGraw Hill (International) Publisher